1. A corona producing device comprising:

corona producing elements arranged in at least one group;

the elements being directed at and spaced from a charge retentive surface;

the elements further being arranged in a profile that reduces shielding effects;

a power source connected to the at least one plurality of corona producing elements; and

supports to which the at least one plurality of corona producing elements are attached.

2. The device of claim 1 wherein the elements include an array of pins projecting toward the charge retentive surface, pins at edges of the array projecting less than pins toward a center of the array.

3. The device of claim 2 wherein the array of pins comprises a first line of pins with pins projecting further toward the charge retentive surface in accordance with their proximity to a center of the first line of pins.

4. The device of claim 3 further comprising bores into which the pins are inserted and in which the pins are held and the depth of pin insertion can be varied to adjust the degree to which the pins project toward the charge retentive surface.

5. The device of claim 3 wherein the array of pins further comprises at least a second substantially parallel line of pins whose pins project further toward the charge retentive surface in accordance with their proximity to edges of the second substantially parallel line of pins.

6. The device of claim 5 wherein the degree of pin projection also varies with the line of pins in which the pins are located.

7. The device of claim 1 wherein the corona producing elements includes an array of pins projecting toward the charge retentive surface, pins at edges of the array being more closely packed than the pins near the center of the array.

8. The device of claim 1 wherein elements comprise an array of teeth projecting toward the charge retentive surface, teeth at edges of the array projecting less than teeth toward a center of the array.

9. The device of claim 8 wherein the array of teeth comprises a first line of teeth with teeth projecting further toward the charge retentive surface in accordance with their proximity to a center of the first line of teeth.

10. The device of claim 9 wherein the first line of teeth includes teeth of a substantial sawtooth configuration.

11. The device of claim 9 wherein the first line of teeth comprises a stamped sheet of metal.

12. The apparatus of claim 1 wherein the profile is determined by iterative adjustment of the elements of the at least one plurality of corona producing elements so that an electric field at substantially all points is substantially equal.

13. A corona producing element profile determination method comprising

determining the electrical potential in space;

determining the spatial variation of the field;

determining the potential in space comprising determining an electrical potential at points throughout a region between a charge-producing array of the corona producing elements and a photoreceptor of a marking machine.

14. The method of claim 13 including solving the Laplace equation

$$\nabla^2 V(x,y) = \left( \frac{\partial}{\partial x^2} + \frac{\partial}{\partial y^2} \right) V(x,y) = 0$$

in which V is the potential and boundary conditions comprise that the corotron electrode elements are assumed to be at one potential, a charge retentive top surface of the photoreceptor is assumed to be at another potential, and the ends of the region display a reflection of the potential of the region.

15. The method of claim 13 wherein, once the potential is obtained, electric field components $E_{x\,i,j}$ and $E_{y\,i,j}$ associated with any mesh point $(i,j)$ is found with:

$$E_{x\,i,j} = \frac{V_{i+1,j} - V_{i,j}}{h}$$

$$E_{y\,i,j} = \frac{V_{i,j+1} - V_{i,j}}{h}$$

where the index $i$ is associated with the $x$ direction and the index $j$ with the y direction.

16. The method of claim 13 wherein the profile is determined by iterative adjustment of the elements so that the electric field at substantially all points is substantially equal.

17. The method of claim 13 further comprising applying the formula:

$$E_{i,j} = \sqrt{E_{x\,i,j}^{\;2} + E_{y\,i,j}^{\;2}}$$

where $(x,y)$ represent matrix coordinates of a point of interest, $i$ and $j$ represent iterations, and $E_{i,j}$ is an electric field at the point $(x,y)$ of interest, to achieve a substantially uniform value of E for all points $(x,y)$ between the at least one corona producing element and the charge retentive surface.

18. A method of substantially uniformly charging a charge retentive surface comprising:

attaching corona charging elements to a power source;

determining a respective electric field distribution over the corona charging elements;

if the respective electric field is substantially non-uniform, adjusting corona charging elements; and

repeating the determining and adjusting until the electric field is substantially uniform.

19. The method of claim 18 wherein attaching corona charging elements to a power source includes mounting elements in at least one group on a conductive surface and substantially perpendicular to the conductive surface so as to project toward the charge retentive surface.

20. The method of claim 19 further comprising sizing elements on an edge of a plurality of elements to project less than elements toward a center of the plurality.

21. The method of claim 18 further comprising altering a curvature of a conductive surface so that elements at an edge of a plurality of elements are farther from the charge retentive surface than elements toward a center of the plurality.

22. The method of claim 18 wherein determining the electric field of each plurality of elements includes:

solving the Laplace equation

$$\nabla^2 V(x,y) = \left(\frac{\partial}{\partial x^2} + \frac{\partial}{\partial y^2}\right) V(x,y) = 0$$

in which V is the potential and boundary conditions comprise that the corotron electrode elements are assumed to be at one potential, a charge retentive top surface of the photoreceptor is assumed to be at another potential, and the ends of the region display a reflection of the potential of the region;

finding electric field components $E_{x\,i,j}$ and $E_{y\,i,j}$ associated with mesh points $(i,j)$ with:

$$E_{x\,i,j} = \frac{V_{i+1,j} - V_{i,j}}{h}$$

$$E_{y\,i,j} = \frac{V_{i,j+1} - V_{i,j}}{h}$$

where the index $i$ is associated with the $x$ direction and the index $j$ with the y direction.

23. The method of claim 18 further comprising applying the formula:

$$E_{i,j} = \sqrt{E_{x\,i,j}^{\;2} + E_{y\,i,j}^{\;2}}$$

where $(x,y)$ represent matrix coordinates of a point of interest, $i$ and $j$ represent iterations, and $E_{i,j}$ is an electric field at the point $(x,y)$ of interest, to achieve a substantially uniform value of E for all points $(x,y)$ between the at least one corona producing element and the charge retentive surface.